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NON-PROVISIONAL
UTILITY PATENT APPLICATION
TRANSMITTAL - 37 CFR 1.53(b)

Duplicate
(check, if applicable)

Jc490 U.S. PRO
09/29/26 PRO
04/23/99

Assistant Commissioner for Patents
BOX PATENT APPLICATION
Washington, DC 20231

Attorney Docket No. 06023-71 (MI/X13033)
First Named Inventor: Valter Maddalon
Express Mail Label No. EL174018426US
Total Pages of Transmittal Form: 2

Transmitted herewith for filing is the **non-provisional** utility patent application entitled:

AUTOMATIC DEVICE FOR FINISHING AND CUTTING MULTIPLE OR SINGLE IMAGES ON PAPER AND OTHER GRAPHIC AND PHOTOGRAPHIC SUBSTRATES IN REEL OR SINGLE SHEETS

which is:

an Original; or
a Continuation, Divisional, or Continuation-in-part (CIP)
of prior Application No. /, filed.

This non-provisional patent application is based on Provisional Patent Application
No. , filed.

Enclosed are:

- Specification (including Abstract) and claims: 9 pages.
- Newly executed Declaration (original).
- Copy of Declaration from prior application.
- Separate Power of Attorney (including 37 CFR 3.73(b) statement, if applicable).
- 2 sheets of drawings (formal) plus one copy.
- Microfiche computer program (Appendix).
- Nucleotide and/or Amino Acid Sequence Submission, including:
 - Computer readable copy Paper Copy Verified Statement.
- Under PTO-1595 cover sheet, an assignment of the invention.
- Certified copy of Application No. , filed , is filed:
 - herewith or in prior application.
- Verified Statement Claiming Small Entity Status under 37 CFR 1.9 and 1.27.
 - was filed in the prior non-provisional application, and such status is still proper and desired (37 CFR 1.28(a));
 - is enclosed herewith; is no longer desired.
- Preliminary Amendment.
- Information Disclosure Statement, PTO-1449, and cited references.
- Other:

The filing fee has been calculated as shown below:

			SMALL ENTITY				LARGE ENTITY	
CLAIMS	NO. FILED	NO. EXTRA	BASIC FEE: \$380.				BASIC FEE: \$760	
Total	8 -20 =	- 0 -	X9	\$	OR	X18	\$	
Independent	1 - 3=	- 0 -	X39	\$	OR	X78	\$	
Multiple Dependent Claims Present			\$130	\$	OR	\$260	\$	
			TOTAL	\$380.00	OR	TOTAL	\$	

The Commissioner is hereby authorized to charge payment of the following fees or credit any overpayment to Deposit Account No. 16-0235. One additional copy of this sheet is enclosed.

- The above calculated filing fee **\$380.00**.
- Any additional fees required under 37 C.F.R. § 1.16.
- Any additional fees required under 37 C.F.R. §1.17.
- If the filing of any paper during the prosecution of this application requires an extension of time in order for the paper to be timely filed, applicant(s) hereby petition(s) for the appropriate extension of time pursuant to 37 C.F.R. §1.136(a).

CORRESPONDENCE ADDRESS:

April 23, 1999
(Date)

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MGB:srn
Enclosures

509.03

MANUAL OF PATENT EXAMINING PROCEDURE

PTO/SB/10 (10-92)

VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c))—SMALL BUSINESS CONCERNDocket Number (Optional)
06023-71Applicant or Patentee: Valter Maddalon

Serial or Patent No.: _____

Filed or Issued: HerewithTitle: Automatic Device For Finishing And Cutting Multiple Or Single Images On Paper And Other Graphic And Photographic Substrates In Reel or Single Sheets

I hereby declare that I am:

the owner of the small business concern identified below;

an official of the small business concern empowered to act on behalf of the concern identified below;

NAME OF SMALL BUSINESS CONCERN FOTOBIA INTERNATIONAL S.a.s. di Alberto Pietro & C.
ADDRESS OF SMALL BUSINESS CONCERN Via G. Marconi, 101 - QUAREGNA (Biella) Italy

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 37 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

the specification filed herewith with title as listed above;

the application identified above;

the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention must file separate verified statements averring to their status as small entities, and no rights in the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization having any rights in the invention is listed below:

no such person, concern, or organization exists.

each such person, concern or organization is listed below.

Separate verified statements are required from each named person, concern or organization having rights in the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING FERLA GIORGIO

ATTORNEY

TITLE OF PERSON IF OTHER THAN OWNER _____

ADDRESS OF PERSON SIGNING V. Cereie 167 - TRIVERO (BI) ITALYSIGNATURE Giorgio DATE April 20, 1992

PTO/SB/10 (10-92)

Rev. 14, Nov. 1992

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

**"AUTOMATIC DEVICE FOR FINISHING AND CUTTING MULTIPLE OR
SINGLE IMAGES ON PAPER AND OTHER GRAPHIC AND
PHOTOGRAPHIC SUBSTRATES IN REELS OR SINGLE SHEETS"**

5 The present invention relates to the finishing and cutting of paper and other graphic and photographic substrates, and in particular to an automatic device which allows, in a quick and simple manner, the cutting, possibly at right angles, of said substrates printed by digital rendering systems.

10 It is known that the photographic technique is undergoing a deep transformation and the present tendency is to use digital printing systems for all those jobs previously made with conventional optical systems.

15 The systems which are presently available have the feature of printing at the same speed on substrates of different size, usually on reels which can reach a width of about 140 cm. In order to increase the productive capacity, given the unlimited possibility of paging of said systems, multiple copies of smaller size, arranged mutually parallel and perpendicularly to the longitudinal axis of the reel, are printed through a single exposure on the largest size allowed.

20 The print in different sizes and at different positions makes the known cutting systems unusable. The cutting operation is then usually carried out with manual means (cutters, etc.) or semiautomatic means which require the operator the optical/manual alignment on the cutting line of the gap between the prints. This implies the need for a continuous attention with a possibility of error and a significant waste of time, this drawback being so much serious as the amount of material to be treated by the operator(s) is greater.

25 Therefore there is a clear necessity for devising systems which relieve the operator of the manual performing of this delicate operation, by making it automatic and thus allowing for a quick, simple and precise way of carrying it out.

30 Among the attempts of solution provided in the prior art, the US patent n.5.586.479 discloses a device for cutting images printed on substrates in sheets not parallel to the sides of the substrates. This prior patent deals with the problem of defining the cut along the edge of the print even when there are no evident optical contrasts between the substrate and the image by creating, through a suitable software, small black marks upstream from the copy. The optical sensors are provided at the side of the substrate and thus the latter must be guided and the 35 sensors' arrangement and position has to be changed at every change in the size, which is particularly disadvantageous when the substrate is made in single sheets.

Anyway, such an automatic cutting system was already used by the applicant since 1986 for paper reels and photocomposition film based on the optical reading of the edge and the creation of a mark. In order to prevent problems of reading errors and misinterpretation of the mark, also the parameter of its length to be measured for acceptance was used, in addition to other security means.

Also the US patent n.5.079.981 relates to an automatic cutting device, in particular for transparent substrates with automatic alignment of the blade on the substrate thanks to two sensors which detect at two different points the transparency-opacity threshold between substrate and image. The time lag between the two signals is converted by a processor into a number of pulses which are used to correct the cutting angle. However, this solution can only be used to trim and cut copies enclosed one by one into a transparent film, while it is clearly useless for separating copies within a larger size where the opacity is constant.

Therefore the object of the present invention is to provide an automatic cutting device, which possibly cuts at right angles, allowing to divide one by one the multiple copies in a quick and simple manner according to the positioning set by the system software during the printing step, without the drawbacks of prior art devices.

This object is achieved by means of a device having the characteristics disclosed in claim 1.

The main feature of the device according to the present invention is that it provides for complex linear optical marks being inserted between the copies or prints, where the cutting is required, which can be easily detected by continuous scanning so as to be cut or removed by means of a double cut parallel to the length of the mark. In this way, the cutting angle correction is carried out with respect to a mark and not to the edge of an opaque material laminated on a transparent material or of images printed not perpendicular to the substrate, which requires side guides. In fact, an important advantage of the present invention is that it can perform the cutting of substrates both in reels and in sheets, even without any guiding system.

These and other advantages and characteristics of the device according to the present invention will be clear to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the annexed drawings wherein:

Fig.1 shows a diagrammatic top plan view of an automatic cutting device according to the present invention, during its normal operation;

Figs.2a and 2b show the device of fig.1 in operation, with the cutting

assembly inclined at opposite angles with respect to the feed direction.

The device according to the present invention provides the automatic and motor-driven alignment of the cutting line to the mentioned marks according to the feed of a substrate 1 of multiple copies 10, 10', 10".

5 This automatic alignment is achieved by using as reference a boundary line M between the single copies, which can be identified by suitable reading systems. The line M includes a preset sequence of properly repeated black and white lines, which is previously stored in the memory of the device, and extends along the whole width of the image so that its presence can be detected even if the substrate 10 1 is without guides or references.

The following detailed description of an embodiment of the present invention refers to the cutting at right angles of photographic paper in a continuous strip or reel, but is obviously valid also for other graphic and photographic substrates.

15 The device according to the present invention provides at least a pair of rollers 2 for the feed of the paper strip 1, a first motor 3 for driving the rollers, a reading system consisting of two optical sensors 4, 4' for the optical reflection detection of the boundary line M between the copies, a mobile cutting assembly 7, a second motor 9 for driving the mobile cutting assembly, a third motor 5 for 20 changing the orientation thereof with respect to the rollers 2 so as to take the mobile cutting assembly in alignment with the mark M, and a microprocessor (not shown) which processes the signal from the reading system and transmits it to the third motor 5.

25 With reference in particular to fig.1, there is seen a strip 1 of multiple copies 10, 10', 10" which is introduced into one end of the device according to the present invention and is fed by the only pair of rollers 2 illustrated in the figure (wherein only the upper roller is shown), which is driven in a known way by the motor 3, until it reaches the reading system which in the present embodiment consists of a pair of optical cells 4, 4'.

30 It should be noted that the substrate sheet 1 must meet only one condition, namely that it covers the area between the optical reading cells so that the mark M can be recognized by both sensors. The distance between the two sensors or cells 4, 4' is preferably equal to 1/10 of the substrate width, whereby a device suitable for a sheet of 82 cm of maximum width will have a distance between the cells of 35 about 8 cm.

The differential reading of the two optical cells is transmitted to the

microprocessor (not shown in the figure) which processes the signal and defines the shifting of the cutting assembly with respect to the edge of the copy, so as to achieve a perfect mutual alignment.

The microprocessor drives, on the basis of the required shifting, the motor 5 (an angular motor in the present embodiment) which carries out the shifting and the subsequent correction of position of the cutting assembly 7 through a driving member 6 (which in the drawing is depicted as a worm screw engaging an end of the mobile cutting assembly 7 in any known way, e.g. a female screw integral therewith). The cutting assembly 7 is pivoted at 8 so that it can rotate as long as it is driven by the motor 5.

The angular displacement for the correction of the alignment is given by way of example in figs.2a and 2b, wherein the cutting assembly takes two different and opposite positions with respect to the normal operation of fig.1, when the female screw of the driving assembly 6 is at the middle of the worm screw. This depends on a possible different inclination of the photographic paper entering the device according to the present invention or on the inclination of the edge of the copy with respect to the feed rollers 2 and the blade of the cutting device 7 arranged in a direction perpendicular to that of the correct paper feed.

It is clear that the cutting is quick, in that it is completely automatic, and perfectly at right angles, since the deviation from the position of correct alignment with the edge of the copy is exactly defined by the optical reading system and as much precisely calculated by the microprocessor connected to the shifting motor system of the cutting assembly so as to cancel said deviation.

Once the cut has been carried out, a second pair of rollers downstream (if any, not shown in the drawings) takes away the copy cut by the device according to the present invention.

It should be noted that the rotation of the cutting assembly could be achieved in a different way, e.g. by providing its engagement with the adjusting motor at one end and its pivoting at 8 at the opposite end.

A device according to the present invention can also be easily provided wherein the orientation of the cutting assembly is fixed whereas the angle of the axis of the feed rollers is adjustable, for example under action of the so-called third motor 5 on the same feed rollers, the axes of which are pivotally mounted, still in order to take the marking lines M in alignment with the blade of the cutting assembly.

The fact that the alignment is carried out on the basis of the optical reading,

by the reading system, of the optical mark printed during the paging step at the edge of the copy or in the boundary area between the copies, allows to choose the reading system according to the optical marking system used during the paging step, thus making the device according to the present invention very versatile and adaptable to the most different needs.

5 In the past, the automatic cutting on the basis of the detection of a mark inserted between photographic images had always been avoided since the risks of error were considered too high. On the contrary, by using the simultaneous reading of two sensors, according to the invention, the recognition of the mark and the consent to the cutting are linked to as much as six different security levels, namely:

10 - the cutting mark consists of a precise white/black sequence stored in the microprocessor, which can recognize through scanning any type of mark with said features without any limit in size;

15 - during the scan, the device microprocessor stores the level of intensity of the white and black lines in order to create thresholds of acceptance and recognition;

20 - each line is also measured in thickness with a precision of 0.05 mm and is then compared with the corresponding stored size;

25 - the sum of the lines must correspond to the stored sum so as to prevent the tolerances, by adding up together, from causing errors;

- the mark M must be detected by both sensors in order to give the consent to the cutting;

30 - after the first alignment and cutting, the angular correction must be within an angle equivalent to the greatest drift which can be caused by the rollers 2 during the paper feed.

In particular, a bar code (consisting in this case of three-four lines of different thickness) allows for a very precise and clean separation of the copies, in that the cut is performed on the first and last line of this code (with the generation of a negligible waste) so that the cut copies do not bear any trace of the marking system, which would remain by using other systems.

35 The possibility that, despite the coincidence of all these conditions, an error occurs all the same is extremely unlikely.

Finally, with the device according to the present invention it is possible to divide and cut the copies present on a digitally printed substrate, in that the insertion of cutting marks to obtain a photocomposition with images (each one framed by said marks) printed so as to form a matrix with rows and columns is

possible and easy only through a digital technique. In fact, once the scan is performed, the single copies can be divided by recognizing and cutting the marks first in one direction and then in the other direction, after having rotated the substrate through 90°.

CLAIMS

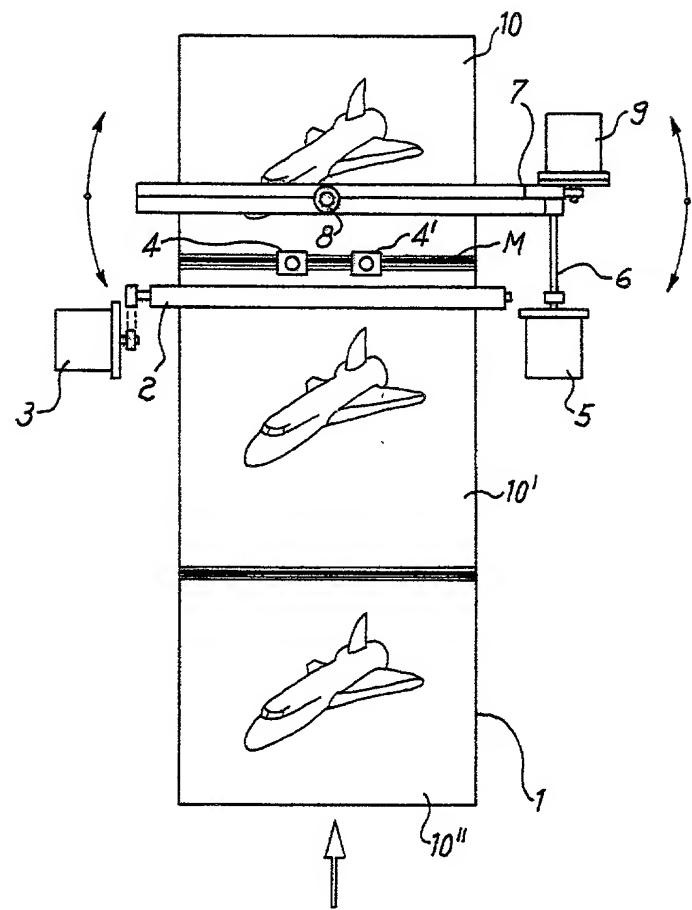
1. An automatic device for trimming and cutting at right angles paper and other graphic and photographic substrates (1) with series of images (10) or "copies" printed thereon and marked by marks (M), comprising at least a pair of rollers (2) for feeding the substrate, a first motor (3) for the driving thereof, a cutting assembly (7), a second motor (9) for driving the latter to cut, a third motor (5) for bringing from time to time into relative alignment said cutting assembly (7) and one of said marks (M), a reading system suitable to detect a boundary mark (M) between the copies, and a microprocessor for processing the signal from said reading system and controlling said third motor (5), characterized in that each mark (M) consists of a preset sequence, stored in said microprocessor, of white and black lines extending at least along a whole edge of each of said images (10) oriented at right angles to the feed direction of the substrate, and in that said reading system consists of a pair of optical sensors (4, 4') located at a distance therebetween smaller than the width of the substrate.
2. A device according to claim 1, wherein said cutting assembly (7) is pivotedly mounted at a point (8) so as to rotate angularly under the action of said third motor (5) to which it is connected at one end in order to get into alignment with said mark (M), said pivoting point (8) being provided at a central area of the cutting assembly or at the end opposite to the end connected to the motor (5).
3. A device according to claim 1, wherein said pair of rollers (2) is pivoted so as to rotate angularly under the action of said third motor (5) in order to take said mark (M) into alignment with said cutting assembly (7) which is fixedly mounted.
4. A device according to claim 1, wherein the distance between the two optical sensors (4, 4') is equal to about 1/10 of the maximum width of the substrate (1) allowed by the cutting width.
5. A device according to claim 1, wherein the measuring of each white or black line forming said mark (M) is carried out with a precision of 0.05 mm.
6. A device according to claim 1, wherein the cutting assembly (7) receives a signal of consent to the cutting only upon recognition of the mark (M) by both optical sensors (4, 4').
7. A device according to claim 1, wherein the feed of the substrate (1) by the rollers (2) takes place without any guide or reference, thus being suitable to perform the cutting in two mutually orthogonal directions upon rotation of the substrate (1) through 90°.

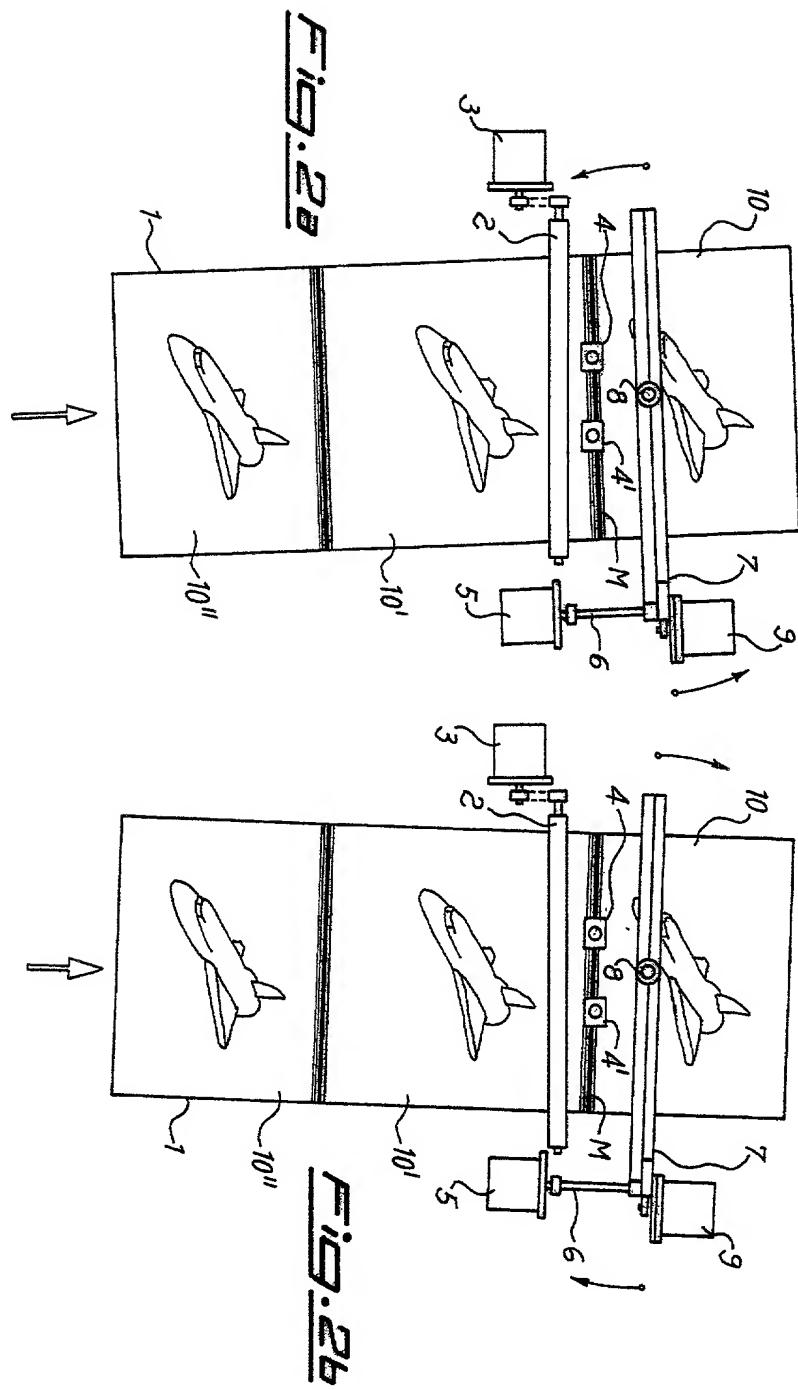
8. A device according to claim 1, wherein the cutting assembly comprises two blades parallel to each other at a distance corresponding to the total size of the mark (M) in the substrate feed direction, whereby the mark is completely removed by cutting.

ABSTRACT

An automatic device for cutting paper and other graphic and photographic substrates in reels or single sheets through optical reflection recognition of complex marks includes at least a pair of rollers (2) for feeding the substrate, a motor (3) for driving said pair of rollers (2), a pair of optical sensors (4, 4') suitable to detect said marks and their angle with respect to the cutting line defined by a cutting assembly (7), a motor (5) for the relative alignment so as to cancel said angle, a motor (9) for driving the mobile blade of said cutting assembly (7), and a microprocessor suitable to process the signals from said optical sensors for controlling said motors (3, 5, 9).

Fig. 1





Attorney Docket No. 06023-71
Ref. No. MI/X13033

DECLARATION AND POWER OF ATTORNEY
(Original Application)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

AUTOMATIC DEVICE FOR FINISHING AND CUTTING MULTIPLE OR SINGLE IMAGES ON PAPER AND OTHER GRAPHIC
AND PHOTOGRAPHIC SUBSTRATES IN REELS OR SINGLE SHEETS.

the specification of which (check one)

is attached hereto.

was filed on _____
as Application Serial No. _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to herein.

I acknowledge the duty to disclose information which is material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119, of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

FOREIGN PRIORITY APPLICATION(S)

			<u>Priority Claimed</u>
MI98U000289 (Number)	ITALY (Country)	23.04.1998 (Day/month/ year filed)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No

And I hereby appoint Ronald L. Panitch, Registration No. 22,825; William W. Schwarze, Registration No. 25,918; Alan S. Nadel, Registration No. 27,363; Leslie L. Kasten, Jr., Registration No. 28,959; Joel S. Goldhammer, Registration No. 22,130; Wallace D. Newcomb, Registration No. 14,823; John Jamieson, Jr., Registration No. 29,546; Michael R. Nagy, Registration No. 33,432; Martin G. Belisario, Registration No. 32,886; Kirk Baumeis ion No. 33,833; Michele L. Simons, Registration No. 000570 ent Agent; and Michael Q. Lee, Registration No. 35 [REDACTED] Agent; as my attorneys or agents with full power [REDACTED] 000570 and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Address all correspondence to PANITCH SCHWARZE JACOBS & NADEL, 1601 Market Street, 36th Floor, Philadelphia, Pennsylvania 19103. Please direct all communications and telephone calls to

Martin G. Belisario at 215-567-2020.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both,

under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Valter MADDALON

Inventor's Signature Valter MADDALON

Date April 20, 1999

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Full name of second joint inventor, if any _____

Inventor's Signature _____

Date _____

Residence _____

Citizenship _____

Post Office Address _____

Full name of third joint inventor, if any _____

Inventor's Signature _____

Date _____

Residence _____

Citizenship _____

Post Office Address _____